

INITIAL REVIEW ENGINEERING REPORT
Other: 15-JAA-DA

CBI: No

Standard Review Draft 3/17/2016

ENGINEER: Xiao Huang \

PV (kg/yr): 1,000 Import Only

SUBMITTER: International Flavors & Fragrances Inc.

USE: Industrial, household cleaning and personal care products

OTHER USES:

MSDS: No

Label: No

TLV/PEL:

CRSS :

Chemical Name: JA-DAA

Chemical Category: polymer

S-H20: 1.085 g/L @ 25.00

VP: 1.9E-10 torr @ 25.00

MW: 1000.00 8.00%<500 32.00%<1000

Physical State and Misc CRSS Info:

Consumer Use:

SAT (concerns) :

Migration to groundwater:

PBT rating: PBT

Health:

Eco:

OCCUPATIONAL EXPOSURE RATING: 1-2A

NOTES & KEY ASSUMPTIONS:

Generated by the 05/27/2004 version of ChemSTEER.

POLLUTION PREVENTION CONSIDERATIONS:

EXPOSURE-BASED REVIEW: No

INITIAL REVIEW ENGINEERING REPORT

CBI: No

Other: 15-JAA-DA

Blending of Fragrance Oils into Commercial and Consumer Products
(volatile liquid)

Number of Sites/ Location: 1

Days/yr: 50

Basis: The September 2010 Emission Scenario Document (ESD) on the Blending of Fragrance Oils into Commercial and Consumer Products provides default values of 250 operating days/yr; 20% aroma chemical in the fragrance oil; 2% fragrance oil in the final commercial and consumer product (i.e. 0.4% aroma chemical in the final product), and 82 kg fragrance oil/site-day (see ESD for additional details). // Note to user: if you encounter a Mass Balance Discrepancy for the number of sites, uncheck the "Daily Mass Input of Raw Material Containing Chemical" and check the "Number of Sites" option. Press the "calculate remaining two parameters" button to recalculate the daily use rate.

Process Description: Fragrance Oil (liquid, 20% - default if unknown) --> Unloading from Transport or Storage Containers --> Mixing (Closed Vessel) --> Packaging --> Final Commercial or Consumer Product (liquid or solid, 0.4% - default if unknown) (per ESD).

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, product sampling wastes are expected to be released to water, incineration, or landfill; due to the lack of industry-specific data, this release is not estimated. It should be noted that EPA expects releases of the chemical from product sampling activities to be relatively low in comparison to the other sources of release in the formulation process.

Water

High End: $3.1\text{E}+0$ kg/site-day over 10 days/yr from 1 site
or $3.1\text{E}+1$ kg/site-yr from 1 site or $3.1\text{E}+1$ kg/yr-all sites
to: NJ0020141 The Middlesex County Utility Authority
from: Cleaning Liquid Residuals from Drums Used to Transport the
Raw Material
basis: EPA/OPPT Drum Residual Model, CEB standard 3% residual.
Per the ESD on the Blending of Fragrance Oils into Commercial and
Consumer Products, "EPA suggests that a 55-gallon drum be used as
a default transport container"; therefore, the EPA/OPPT Drum
Residual Model may be used to estimate this release. Container
cleaning may involve organic and water wash, which could be
released to water, incineration, or landfill, per ESD.

Water

Conservative: $1.6\text{E}-1$ kg/site-day over 50 days/yr from 1 site
or $7.8\text{E}+0$ kg/site-yr from 1 site or $7.8\text{E}+0$ kg/yr-all sites
to: On-site wastewater treatment. Treated wastewater to NJ0024708
Bayshore Regional Sewerage Authority (BRSA); sludge to NJ
0108707/NJ0021016 Passaic Valley Sewerage Commissions (PVSC)
from: Equipment Cleaning Losses
basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1%
residual.

Air

Output 2: $6.737387\text{E}-16$ kg/site-day over 10 days/yr from 1 site
or $6.7\text{E}-15$ kg/site-yr from 1 site or $6.7\text{E}-15$ kg/yr-all sites
to: Air (per ESD)
from: Cleaning Liquid Residuals from Drums Used to Transport the
Raw Material
basis: EPA/OPPT Penetration Model. Per the ESD on the Blending of
Fragrance Oils into Commercial and Consumer Products, "if the
chemical is volatile, it may vaporize while empty containers are
being rinsed and cleaned; therefore, a release to air from
container cleaning may occur"; EPA suggests using the EPA/OPPT
Penetration Model for estimating releases to air from containers
cleaned indoors.

Air

Typical: $2.0\text{E}-15$ kg/site-day over 50 days/yr from 1 site
or $1.0\text{E}-13$ kg/site-yr from 1 site or $1.0\text{E}-13$ kg/yr-all sites
Worst Case: $4.0\text{E}-15$ kg/site-day over 50 days/yr from 1 site
or $2.0\text{E}-13$ kg/site-yr from 1 site or $2.0\text{E}-13$ kg/yr-all sites
to: Air (per ESD)
from: Unloading Liquid Raw Material from Drums

basis: EPA/OAQPS AP-42 Loading Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "if the chemical is volatile, it may vaporize while containers are being unloaded"; EPA suggests using EPA/OAQPS AP-42 Loading Model to estimate releases for transfer operations.

Air

Typical: $2.326537\text{E-}18$ kg/site-day over 50 days/yr from 1 site or $1.163269\text{E-}16$ kg/site-yr from 1 site or $1.163269\text{E-}16$ kg/yr-all sites

Worst Case: $1.86123\text{E-}17$ kg/site-day over 50 days/yr from 1 site or $9.30615\text{E-}16$ kg/site-yr from 1 site or $9.30615\text{E-}16$ kg/yr-all sites

to: Air (per ESD)

from: Fugitive Air Releases During Mixing Operations

basis: EPA/OPPT Penetration Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "volatile chemicals can potentially be released to the air during mixing even at room temperature"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air.

Air

Typical: $2.326537\text{E-}18$ kg/site-day over 50 days/yr from 1 site or $1.163269\text{E-}16$ kg/site-yr from 1 site or $1.163269\text{E-}16$ kg/yr-all sites

Worst Case: $1.86123\text{E-}17$ kg/site-day over 50 days/yr from 1 site or $9.30615\text{E-}16$ kg/site-yr from 1 site or $9.30615\text{E-}16$ kg/yr-all sites

to: Air (per ESD)

from: Open Surface Losses to Air During Product Sampling

basis: EPA/OPPT Penetration Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "if the chemical is volatile, it may volatilize and be emitted from the process during product QA/QC sampling activities"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air as this operation is likely to occur indoors.

Air

Output 2: $8.7\text{E-}14$ kg/site-day over 50 days/yr from 1 site or $4.4\text{E-}12$ kg/site-yr from 1 site or $4.4\text{E-}12$ kg/yr-all sites

to: Air (per ESD)

from: Equipment Cleaning Losses

basis: EPA/OPPT Mass Transfer Coefficient Model. Per ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "for volatile chemicals, fugitive releases may occur during equipment cleaning operations"; EPA suggests using the EPA/OPPT Mass Transfer Coefficient Model for estimating releases during cleaning operations. The EPA standard diameter of the opening of a vessel for cleaning operations is 92 cm.

Air

Typical: $2.0\text{E-}14$ kg/site-day over 50 days/yr from 1 site
or $1.0\text{E-}12$ kg/site-yr from 1 site or $1.0\text{E-}12$ kg/yr-all sites
Worst Case: $2.0\text{E-}14$ kg/site-day over 50 days/yr from 1 site
or $1.0\text{E-}12$ kg/site-yr from 1 site or $1.0\text{E-}12$ kg/yr-all sites
to: Biofilter, removing 90% organics
from: Loading Liquid Product into Containers
basis: EPA/OAQPS AP-42 Loading Model.

Landfill

Conservative: $2.9\text{E-}3$ kg/site-day over 50 days/yr from 1 site
or $1.4\text{E-}1$ kg/site-yr from 1 site or $1.4\text{E-}1$ kg/yr-all sites
to: On-site wastewater treatment. Treated wastewater to NJ0024708 Bayshore Regional Sewerage Authority (BRSA); sludge to NJ 0108707/NJ0021016 Passaic Valley Sewerage Commissions (PVSC)
from: Equipment Cleaning Losses
basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual.

Destroyed

Typical: $1.8\text{E-}14$ kg/site-day over 50 days/yr from 1 site
or $9.1\text{E-}13$ kg/site-yr from 1 site or $9.1\text{E-}13$ kg/yr-all sites
Worst Case: $3.6\text{E-}14$ kg/site-day over 50 days/yr from 1 site
or $1.8\text{E-}12$ kg/site-yr from 1 site or $1.8\text{E-}12$ kg/yr-all sites
to: Air (per ESD)
from: Unloading Liquid Raw Material from Drums
basis: EPA/OAQPS AP-42 Loading Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "if the chemical is volatile, it may vaporize while containers are being unloaded"; EPA suggests using EPA/OAQPS AP-42 Loading Model to estimate releases for transfer operations.

Destroyed

Typical: $2.093884\text{E-}17$ kg/site-day over 50 days/yr from 1 site
or $1.0\text{E-}15$ kg/site-yr from 1 site or $1.0\text{E-}15$ kg/yr-all sites
Worst Case: $1.675107\text{E-}16$ kg/site-day over 50 days/yr from 1 site
or $8.4\text{E-}15$ kg/site-yr from 1 site or $8.4\text{E-}15$ kg/yr-all sites
to: Air (per ESD)
from: Fugitive Air Releases During Mixing Operations

basis: EPA/OPPT Penetration Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "volatile chemicals can potentially be released to the air during mixing even at room temperature"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air.

Destroyed

Typical: 2.093884×10^{-17} kg/site-day over 50 days/yr from 1 site or 1.0×10^{-15} kg/site-yr from 1 site or 1.0×10^{-15} kg/yr-all sites
Worst Case: 1.675107×10^{-16} kg/site-day over 50 days/yr from 1 site or 8.4×10^{-15} kg/site-yr from 1 site or 8.4×10^{-15} kg/yr-all sites
to: Air (per ESD)

from: Open Surface Losses to Air During Product Sampling
basis: EPA/OPPT Penetration Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "if the chemical is volatile, it may volatilize and be emitted from the process during product QA/QC sampling activities"; EPA suggests using the EPA/OPPT Penetration Model to estimate releases to air as this operation is likely to occur indoors.

Destroyed

Conservative: 4.1×10^{-2} kg/site-day over 50 days/yr from 1 site or 2.1×10^0 kg/site-yr from 1 site or 2.1×10^0 kg/yr-all sites
to: On-site wastewater treatment. Treated wastewater to NJ0024708 Bayshore Regional Sewerage Authority (BRSA); sludge to NJ 0108707/NJ0021016 Passaic Valley Sewerage Commissions (PVSC)
from: Equipment Cleaning Losses
basis: EPA/OPPT Single Vessel Residual Model, CEB standard 1% residual.

Destroyed

Output 2: 7.9×10^{-13} kg/site-day over 50 days/yr from 1 site or 3.9×10^{-11} kg/site-yr from 1 site or 3.9×10^{-11} kg/yr-all sites
to: Air (per ESD)
from: Equipment Cleaning Losses
basis: EPA/OPPT Mass Transfer Coefficient Model. Per ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "for volatile chemicals, fugitive releases may occur during equipment cleaning operations"; EPA suggests using the EPA/OPPT Mass Transfer Coefficient Model for estimating releases during cleaning operations. The EPA standard diameter of the opening of a vessel for cleaning operations is 92 cm.

Destroyed

Typical: 1.8×10^{-13} kg/site-day over 50 days/yr from 1 site or 9.1×10^{-12} kg/site-yr from 1 site or 9.1×10^{-12} kg/yr-all sites
Worst Case: 1.8×10^{-13} kg/site-day over 50 days/yr from 1 site or 9.1×10^{-12} kg/site-yr from 1 site or 9.1×10^{-12} kg/yr-all sites

to: Biofilter, removing 90% organics
from: Loading Liquid Product into Containers
basis: EPA/OAQPS AP-42 Loading Model.

RELEASE TOTAL
4.1E+1 kg/yr - all sites

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: 6
Basis: The ESD on the Blending of Fragrance Oils into Commercial and Consumer Products conservatively estimates exposure for up to 29 workers per site while performing formulation process activities; it can be conservatively estimated that all workers are exposure during each activity.

Inhalation:

Note that the ESD specifies inhalation exposure from the following activities: (1) Unloading Transport Containers; (2) Transport Container Cleaning; (3) Product Sampling; (4) Equipment Cleaning; and (5) Product Loading. Since the exposure estimates are the same for all liquid and solid activities (EPA/OPPT Mass Balance Model; OSHA Total PNOR PEL Limiting model, > 54 kg/day, or EPA/OPPT Small Volume Solids Handling Inhalation Model, < 54 kg/day), two exposure scenarios are presented for all workers.

Exposure to Vapor (non-volatile) (Class II)

Typical:

- > Potential Dose Rate: 3.2E-13 mg/day over 10 days/yr
- > Lifetime Average Daily Dose: 6.943163E-17 mg/kg-day over 10 days/yr
- > Average Daily Dose: 1.215054E-16 mg/day over 10 days/yr
- > Acute Potential Dose: 4.6 E-15 mg/day over 10 days/yr

Worst Case:

- > Potential Dose Rate: 9.7E-12 mg/day over 10 days/yr
- > Lifetime Average Daily Dose: 2.1 E-15 mg/kg-day over 10 days/yr
- > Average Daily Dose: 3.6 E-15 mg/day over 10 days/yr
- > Acute Potential Dose: 1.4E-13 mg/day over 10 days/yr

Number of workers (all sites) with inhalation exposure: 1

Basis: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material; EPA/OPPT Mass Balance Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, containers are assumed to be cleaned at the formulation site to perform a conservative assessment.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
 - 2)a) Exposure level > 1 mg/day? No
 - OR
 - b) Hazard Rating for health of 2 or greater? No
- => Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (non-volatile) (Class II)

Typical:

- > Potential Dose Rate: 9.7E-12 mg/day over 50 days/yr
- > Lifetime Average Daily Dose: 1.1E-14 mg/kg-day over 50 days/yr
- > Average Daily Dose: 1.9E-14 mg/day over 50 days/yr
- > Acute Potential Dose: 1.4E-13 mg/day over 50 days/yr

Worst Case:

- > Potential Dose Rate: 5.8E-10 mg/day over 50 days/yr
- > Lifetime Average Daily Dose: 6.5E-13 mg/kg-day over 50 days/yr
- > Average Daily Dose: 1.1E-12 mg/day over 50 days/yr

> Acute Potential Dose: 8.3E-12 mg/day over 50 days/yr
Number of workers (all sites) with inhalation exposure: 1
Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT Mass Balance Model.
NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? No
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (non-volatile) (Class II)

Typical:

- > Potential Dose Rate: 1.1E-14 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 1.247825E-17 mg/kg-day over 50 days/yr
> Average Daily Dose: 2.183694E-17 mg/day over 50 days/yr
> Acute Potential Dose: 1.594096E-16 mg/day over 50 days/yr

Worst Case:

- > Potential Dose Rate: 2.7E-12 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 3.0 E-15 mg/kg-day over 50 days/yr
> Average Daily Dose: 5.2 E-15 mg/day over 50 days/yr
> Acute Potential Dose: 3.8E-14 mg/day over 50 days/yr

Number of workers (all sites) with inhalation exposure: 1

Basis: Fugitive Air Releases During Mixing Operations; EPA/OPPT Mass Balance Model.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? No
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (non-volatile) (Class II)

Typical:

- > Potential Dose Rate: 1.1E-14 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 1.247825E-17 mg/kg-day over 50 days/yr
> Average Daily Dose: 2.183694E-17 mg/day over 50 days/yr
> Acute Potential Dose: 1.594096E-16 mg/day over 50 days/yr

Worst Case:

> Potential Dose Rate: 2.7E-12 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 3.0 E-15 mg/kg-day over 50 days/yr
> Average Daily Dose: 5.2 E-15 mg/day over 50 days/yr
> Acute Potential Dose: 3.8E-14 mg/day over 50 days/yr
Number of workers (all sites) with inhalation exposure: 1
Basis: Open Surface Losses to Air During Product Sampling;
EPA/OPPT Mass Balance Model.
NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? No
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (non-volatile) (Class II)

Typical:

> Potential Dose Rate: 5.3E-12 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 5.9 E-15 mg/kg-day over 50 days/yr
> Average Daily Dose: 1.0E-14 mg/day over 50 days/yr
> Acute Potential Dose: 7.6E-14 mg/day over 50 days/yr

Worst Case:

> Potential Dose Rate: 4.8E-11 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 5.3E-14 mg/kg-day over 50 days/yr
> Average Daily Dose: 9.3E-14 mg/day over 50 days/yr
> Acute Potential Dose: 6.8E-13 mg/day over 50 days/yr

Number of workers (all sites) with inhalation exposure: 1

Basis: Equipment Cleaning Losses; EPA/OPPT Mass Balance Model.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? No
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (non-volatile) (Class II)

Typical:

> Potential Dose Rate: 9.7E-11 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 1.1E-13 mg/kg-day over 50 days/yr
> Average Daily Dose: 1.9E-13 mg/day over 50 days/yr
> Acute Potential Dose: 1.4E-12 mg/day over 50 days/yr

Worst Case:

> Potential Dose Rate: 2.9E-9 mg/day over 50 days/yr
> Lifetime Average Daily Dose: 3.3E-12 mg/kg-day over 50 days/yr
> Average Daily Dose: 5.7E-12 mg/day over 50 days/yr
> Acute Potential Dose: 4.2E-11 mg/day over 50 days/yr
Number of workers (all sites) with inhalation exposure: 1
Basis: Loading Liquid Product into Containers; EPA/OPPT Mass
Balance Model.
NOTE: The respirator class is: II. Gas/vapor (all substances in
the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit,
or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? No
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Dermal:

Note that the ESD specifies dermal exposure from the following
activities: (1) Unloading Transport Containers; (2) Transport
Container Cleaning; (3) Product Sampling; (4) Equipment
Cleaning; (5) Product Loading. Since the exposure estimates are
the same for all liquid and solid activities (EPA/OPPT Direct
2-Hand Contact with Liquid Model and EPA/OPPT Direct 2-Hand
Dermal Contact with Solids Model, respectively), two exposure
scenarios are presented for all workers.

Exposure to Liquid at 50.00% concentration

High End:

- > Potential Dose Rate: 1.1E+3 mg/day over 10 days/yr
- > Lifetime Average Daily Dose: 2.4E-1 mg/day over 10 days/yr
- > Average Daily Dose: 4.2E-1 mg/day over 10 days/yr
- > Acute Potential Dose: 1.6E+1 mg/day over 10 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Cleaning Liquid Residuals from Drums Used to Transport the Raw Material; EPA/OPPT 2-Hand Dermal Contact with Liquids Model. Per the ESD on the Blending of Fragrance Oils into Commercial and Consumer Products, "there is potential for dermal exposure during transport containers cleaning."

Exposure to Liquid at 50.00% concentration

High End:

- > Potential Dose Rate: 1.1E+3 mg/day over 50 days/yr
- > Lifetime Average Daily Dose: 1.3E+0 mg/day over 50 days/yr
- > Average Daily Dose: 2.2E+0 mg/day over 50 days/yr
- > Acute Potential Dose: 1.6E+1 mg/day over 50 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Unloading Liquid Raw Material from Drums; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.

Exposure to Liquid at 50.00% concentration

High End:

- > Potential Dose Rate: 5.6E+2 mg/day over 50 days/yr
- > Lifetime Average Daily Dose: 6.3E-1 mg/day over 50 days/yr
- > Average Daily Dose: 1.1E+0 mg/day over 50 days/yr
- > Acute Potential Dose: 8.0E+0 mg/day over 50 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Open Surface Losses to Air During Product Sampling; EPA/OPPT 1-Hand Dermal Contact with Liquids Model.

Exposure to Liquid at 5.00% concentration

High End:

- > Potential Dose Rate: 1.1E+2 mg/day over 50 days/yr
- > Lifetime Average Daily Dose: 1.3E-1 mg/day over 50 days/yr
- > Average Daily Dose: 2.2E-1 mg/day over 50 days/yr
- > Acute Potential Dose: 1.6E+0 mg/day over 50 days/yr

Number of workers (all sites) with dermal exposure: 1

Basis: Loading Liquid Product into Containers; EPA/OPPT 2-Hand Dermal Contact with Liquids Model.